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ABSTRACT

The effort to make the Connecticut Elementary Education Certification Examination (EECE) reflect the skills and knowledge essential to successful beginning teaching is described. This instrument is planned as part of an assessment system being created by the Connecticut State Department of Education. The first element of the program is a basic skills examination in reading, writing, and mathematics, administered in the undergraduate program. The second element--the EECE--is given to those who have passed a basic skills exam, have a degree, and have completed of a teacher education course as a prerequisite to an initial teaching certificate. The EECE underscores the importance of subject matter (SM) knowledge, but recognizes that in the classroom, SM is fused with pedagogy. Thus, the integration of SM and pedagogical knowledge is evaluated with classroom-relevant materials that allow examinees to make decisions that closely reflect demands of teaching. SM knowledge and integrated knowledge of subject and pedagogical techniques are assessed through materials-based test items that include multiple-choice questions. Pedagogical knowledge is assessed by traditional multiple-choice items and videotaped stimulus items. A completed trial videotape includes 11 test items; these simulations allow examinees to make observations and decisions that approximate teaching demands. A flowchart illustrates the program structure. (SLD)

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# ELEMENTARY EDUCATION LICENSURE EXAMINATIONS FOR THE '90s

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# Elementary Education Licensure Examinations for the '90s

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The goal of this paper is to describe an effort to make the form and content of a teacher certification examination reflect the skills and knowledge essential to successful beginning teaching. The examination, which is now being developed, is the Connecticut Elementary Education Certification Examination.

This examination is one element in a comprehensive teacher assessment program now being created by the Connecticut State Department of Education (CSDE). The program, portions of which are being developed in conjunction with IOX Assessment Associates of Los Angeles, California, is known as the Connecticut Teacher Examination Program. In developing this program, CSDE intends to develop an assessment system that incorporates the most current notions concerning effective teacher evaluation.

Once fully developed, the assessment process will take place over three years, during which a prospective teacher will be evaluated on dimensions ranging from fundamental reading and writing skills to complex, integrated tasks highly relevant to classroom teaching. It is hoped that by evaluating teacher candidates from a variety of perspectives, a full picture of an individual's strengths and weaknesses as they relate to the teaching profession can be developed.

## An Overview of the Connecticut Teacher Examination Program

To understand what the Elementary Education Certification Examination is designed to accomplish, it may be useful to see where in the overall evaluation system this test will be employed. In Figure 1, it can be seen that the first element in the assessment program is a basic skills examination in reading, writing, and mathematics administered during an individual's undergraduate program. The second element, the Elementary Education Certification Examination, is administered to individuals who have passed the basic skills exam and successfully completed an undergraduate degree and a teacher education program. Prospective teachers who successfully complete the Elementary Education Certification Examination receive an initial teaching certificate and begin teaching. The third step in the assessment program occurs during candidates' first year of teaching when they are further evaluated by means designed to reflect the complex demands of teaching, as well as their growing experience. At the end of their first year of teaching, examinees are assigned a weighted score based on a composite of the evaluations completed during that year. Successful examinees are awarded a provisional, multi-year teaching certificate.

## Categories of Knowledge in the Certification Exam

The Elementary Education Certification Examination, then, is the second of three major evaluation activities. It is

administered to individuals who, in theory, are prepared to enter the classroom. This intermediate examination is designed to test the formal knowledge the examinee has gained in university training. That knowledge can be divided roughly into three categories: subject matter knowledge, pedagogical knowledge, and a third category of knowledge, which we will refer to as the integration of content and pedagogy. Readers will note the influence of Shulman (1986, 1987a, 1987b) in these categorizations. For the purposes of test development, we have collapsed Shulman's various lists of knowledge domains into three somewhat broader categories.

Subject-Matter Knowledge

Subject-matter content knowledge is an examinee's knowledge of the concepts, principles, and facts of the content disciplines: mathematics, history, literature, and so forth. A principle concern regarding subject matter is to identify the bodies of subject-matter knowledge that are essential for effective teaching. A second concern regards the depth of subject knowledge necessary to teach a given subject effectively at a particular grade level. These two questions, "Is it essential?" and if so, "How much of it must a teacher know?", form the basis for determining the subject-matter knowledge base.

Pedagogical Knowledge

A second domain of knowledge can be called pedagogical knowledge. In broad terms, the pedagogical knowledge base

contains information germane to the act of teaching. An examinee's pedagogical knowledge should include knowledge of human development, the nature of learners and learning, classroom management, and knowledge about human motivation and behavior management. Also included in this knowledge category would be curricular knowledge, including information about instructional approaches, resources and materials, lesson planning, student assessment, and some of what Shulman calls "knowledge of educational contexts" (1987a, p.8), particularly with respect to legal and regulatory requirements.

Integrated Knowledge

Most difficult to define is the knowledge base created by the integration of subject-matter knowledge with pedagogical knowledge. This knowledge base contains pedagogical information relevant to teaching some particular subject matter. It is important to note that much of this knowledge base is created by the teacher, rather than supplied through schooling. Certainly much pedagogical information relevant to particular subject-area content is provided in teacher education classes, but this information can only cover a small segment of the content-area information that a teacher will cover during a school year. Typically, a teacher will have subject-matter information available, but in order to teach effectively will have to apply pedagogical knowledge to it. For each lesson, the teacher must decide what the students know, how to approach the material, what resources to use, and so on. In making and executing these

decisions, the teacher adds information to the integrated knowledge base. In effective teaching, it could be argued, most knowledge becomes integrated knowledge as the successful teacher constantly modifies the presentation of content in response to pedagogical concerns.

## Knowledge Categories and Assessment Formats

As test developers, we have sought to determine the most appropriate form of assessment for each of the three knowledge domains described above. Our efforts have led us to three different, overlapping assessment foci, to which we will now turn.

### Subject-Matter Knowledge Assessment

For the purpose of assessing an examinee's subject-area knowledge, the Connecticut Elementary Education Certification Examination employs multiple-choice test items predominantly. Although each item places the content being tested in a classroom context, the essential purpose of many of the items is to determine that the prospective educator possesses the requisite subject-matter knowledge. Subject-matter objectives have been developed in pedagogy, reading/language arts, mathematics, social studies, science, multicultural/bilingual education, arts, physical education, health, and special education. The use of multiple-choice items for certification exams is well supported. This format has among its virtues legal defensibility, cost effectiveness, and scoring efficiency. In situations such as

this, multiple-choice items generally correlate well with short-answer response formats (e.g., Mehrens, 1987, p.207).

Integrated Knowledge Assessment

For the purpose of assessing examinees' knowledge of pedagogy integrated with subject matter, the Connecticut Elementary Education Certification Examination employs two test item formats.

Traditional multiple-choice items. Multiple-choice test items will be used to integrate pedagogical knowledge with most subject-matter areas. In such items, the examinee is presented with a subject-matter context in which both subject-matter knowledge and pedagogical considerations must be applied. In a typical item of this type, an examinee might be asked to select the most developmentally appropriate explanation for some piece of content knowledge. Such items are designed so as to require the examinee to understand both the subject matter in question and the relevant developmental sequence.

A second type of integrated multiple-choice item requires examinees to display knowledge of subject-matter content that is by its nature integrated with pedagogical concerns. For example, in the teaching of writing, considerable research has documented the effectiveness of teaching writing as a process. The general outline of this process is a matter of pedagogy, although the teaching of writing requires considerable subject-matter knowledge of grammar, levels of style, logic and argumentation, vocabulary, and so forth. While an item on the writing process

could appear to be focused on knowledge of writing, it will often be fused with knowledge of the pedagogy of writing instruction.

Materials-based items. Materials-based test items in a multiple-choice format will also be used to assess the integrated knowledge base. Although this assessment format is at present infrequently used in education, we feel that it has considerable merit, and accordingly, wish to explore its potential in greater detail at this time. In materials-based test items, each item, or set of items, is linked to materials relevant to the classroom. The use of reference or supplementary materials is relatively common in other professions' licensure examinations (Wise & Darling-Hammond, 1987), as such materials increase the job relevance of an assessment procedure. By developing test items around worksheets, Individualized Education Plans (IEPs), textbook excerpts, student cumulative folders, student assignments, reference materials, and other such common classroom materials, the test can more closely approximate the skills required by a classroom teacher.

Two types of materials can be distinguished by their functions. Reference materials such as maps, supplementary textbook materials for teachers, math or science data, and instructions for classroom simulations, allow the test developer to place more emphasis on higher-order thinking and problem-solving skills without requiring a concomitant increase in the level of subject-matter knowledge required of examinees. Clearly, teachers do not keep in their heads every piece of

knowledge relevant to teaching a given subject. The ability to use research and reference materials effectively increases the range of knowledge the educator can draw upon. By providing materials from which the examinee makes decisions or draws inferences, the test developer can require higher-level problem-solving without making unreasonable recall demands on the examinee.

Other types of materials allow the creation of test items that relate very directly to the classroom concerns of teachers. For example, provided with a set of worksheets on single-digit multiplication problems, an examinee could be asked to determine which worksheet has the most advanced, or most elementary, content. Provided with excerpts from teacher's manuals, examinees could be asked to identify inaccurate presentations of material, or examples of activities more or less likely to foster student motivation or self-esteem. Provided with a worksheet or lesson completed by a student, examinees could be asked to diagnose the likely source of student errors or to recommend a course of corrective instruction. In assessing understanding of educational data, such as that found in cumulative folders or IEPs, materials-based items provide a high degree of task verisimilitude.

The creative test developer will find other contexts in which materials-based items can provide an accurate reflection of actual job tasks. For example, to test examinees' knowledge of techniques for assessing student writing, one could supply test-

takers with examples of student writing on which teacher corrections had been made. The examinees could then be asked to evaluate the scoring. Note that in addition to approximating an important teaching skill, this method of assessment succeeds at integrating content knowledge (of composition) and pedagogy (both general pedagogy and content pedagogy).

Before concluding this discussion of materials-based test items, we would like to observe a potential in this item type that may prove to be of value in teacher-assessment efforts. When assessing the subject-matter knowledge of teacher candidates, a crucial, but unresolved, issue concerns the extent of subject-matter content a teacher must have internalized in order to teach a given subject effectively. Put simply, if one is to teach Earth Science to 4th graders, how much knowledge of Earth Science should one have in one's head? Most would agree, we believe, that a teacher's knowledge of a subject should exceed that which is presented to students. But no consensus exists on how much more the teacher must know than the students. In many ways, this question is more difficult for primary grade instruction than it is for secondary instruction, where we can begin to expect teachers to possess a specialist's breadth and depth of knowledge (see Shulman, 197a, p.9). The work of many authors suggests that questions about the knowledge base will become a central research topic in the 1990s. For both theoretical and practical reasons, we find this trend encouraging.

In summary, materials-based teacher assessment allows the examination of a candidate's ability to perform classroom-relevant tasks that integrate subject-matter knowledge with several types if pedagogical knowledge. Such items can also be used to require examinees to make inferences, reason effectively, and use higher-order thinking skills, while not demanding that the examinee be responsible for an unreasonable store of information. In order to assess complex thinking skills, complex subject matter is often required. The use of sophisticated supplementary and reference materials allows the depth of content-area knowledge required of examinees to vary. By the extent of information supplied in materials-based items, a teacher certification exam can be adjusted to require the depth of subject-matter knowledge determined appropriate by the education community.

Pedagogical Knowledge Assessment

Thus far, we have considered the evaluation of two of the sub-domains of knowledge that the Connecticut Elementary Certification Examination will require of prospective teachers. What remains is to discuss the assessment of knowledge of classroom pedagogy.

The pedagogical knowledge base covers a tremendous range of information. For the purpose of making our next point, we will divide this broad field into two classifications based on whether a particular type of knowledge is typically applied in a social/interactive context or not: low-interactive pedagogy and

high-interactive pedagogy. Although the categories may remain distinct, many of the skills subsumed under them could be found in either category at any given time, depending on context. A few kinds of pedagogical knowledge probably remain more or less in one category.

For example, knowledge of the sequence of human development is generally low interactive; a teacher would be more likely to have determined in advance how operational stages or degree of emotional development in students should influence classroom activity. Effective questioning strategy, in contrast, is high interactive; questioning students nearly always occurs in face-to-face interaction. A third example might be methods of enhancing self-esteem. Knowledge of ways in which to increase students' sense of self-worth might well be applied in class while interacting with students (high interactive), or it could be used while designing future classroom activities (low interactive).

Whether these categories would withstand scrutiny is a subject for consideration elsewhere. We have introduced them here as a convenience to explain our use of two formats for assessing pedagogical knowledge.

The Elementary Education Certification Examination uses traditional, multiple-choice items and videotaped-stimulus items to assess knowledge of pedagogy. Typically low-interactive pedagogical knowledge, or pedagogical knowledge framed in a low interactive situation, is assessed using multiple-choice test

items. In most instances, information being assessed in multiple-choice items is parallel in form to that of other subject-matter areas, i.e., facts. In this circumstance, multiple-choice items are fully appropriate.

For knowledge applied while interacting with students, however, the context in which the knowledge is applied is critical to using the knowledge effectively. In the past 20 years, much research has been done in the general area of teacher effectiveness. Summaries of that research, such as Brophy and Good (1986), Rosenshine and Stevens (1986), and Doyle (1986), make clear that we can point to more effective and less effective ways for teachers to interact with students and manage classrooms. Certainly this information is essential for prospective teachers. Obtaining a relatively valid assessment of examinees' knowledge of such information is difficult, however, because the knowledge is employed in a complex decision-making environment far removed from a test of research findings. In the classroom, the use of teacher-effectiveness pedagogy becomes highly reliant upon observational skills. As a consequence, knowing the principles of student feedback is very different from recognizing them in a classroom.

Faced with the importance of assessing highly contextualized skills that are most often employed in interpersonal situations, CSDE and IOX decided to have examinees answer questions based on their observations of a videotaped elementary classroom in an

attempt to more closely approximate the knowledge and skills we desire examinees to possess.

Scripted versus documentary stimuli. The decision to use videotape was initially a calculated risk that a visual item stem could be created that would enhance the validity of the examination by increasing the authenticity of the assessment task. Our goal was to present a naturalistic elementary classroom that examinees would observe. Following viewing, examinees could be asked to analyze problems, suggest improvements, or describe actions they observed.

There were numerous choice points in designing the videotaped items. The most critical of these was our decision to use professional actors and scripted situations rather than documentary footage of classrooms. The argument in favor of using documentary footage was the absolute veracity of the scenes presented to examinees. Taping actual classrooms held the promise of providing us with the most naturalistic and authentic footage possible. Such an approach holds considerable perils, however.

The greatest danger of actual classroom taping from the test developer's perspective is difficulty of obtaining the footage needed to serve as the stimuli for test questions. Our concern was that dozens of hours of taping in live classrooms would yield too few moments that were sufficiently discrete and specific as to be understandable after a relatively brief viewing. Numerous authors have pointed to the diffuse nature of pedagogical

practices (see, for example, Stodolsky, 1984, p.17); they may take place over minutes or hours, they may take place in private conversation; they may be so embedded in a specific situation that the pedagogical gem, as it were, is difficult to observe.

A test item can be seen as an idealization of reality. Items concerned with human interaction require that a considerable amount of extraneous context be stripped away, thereby distilling the essential information needed to answer the question. Our goal is to have examinees demonstrate knowledge of good pedagogical practices in a classroom; we are not administering an examination to master educators or anthropologists, nor are we creating a mentor-teacher exercise.

A second concern about documentary footage was that we would be too constrained in designing test items. If, in the hours of tape, no educator happened to elaborate on a hesitant answer, there could be no item on that subject. Clearly, such a lack of control is unacceptable. We could not require working teachers to use particular pedagogical techniques because we wished to include those techniques in the exam.

A third drawback to documentary footage was that we saw value in using examples of poor teaching practices. All teachers make decisions that are less than ideal and benefit can come from recognizing these errors. We were hesitant, however, to use practicing educators as examples of bad teaching.

In light of these concerns, we decided to construct a school setting rather than observe one. As with all our test

development efforts, we began with objectives developed by state educators and created a set of items to test those objectives. From these, we created a script composed of one-to-three minute scenes, each built around one or two test items. In each scene, typical classroom activity is taking place: a math lesson, a spelling contest, a reading circle, and so on. The sequences were taped in a local elementary school using professional actors in most speaking roles. A small professional crew operated the video equipment. Students from the elementary school were used in non-speaking roles. All phases of the production were supervised by IOX and CSDE staff.

The completed trial version is a 45-minute tape that includes 11 test items. A narrator introduces each item and instructs examinees when to answer questions. The items were developed in both selected and constructed response formats. A full-scale field test has not yet been administered.

## Challenges in Video Stimulus Development

Videotaped test items offer challenges for both test developer and examinee that are not present in traditional pencil-and-paper items. Film making is a powerful and complex activity. We have all had the experience of coming out of a movie saying, "I didn't understand what was happening when...," or "Oh, I didn't notice that.. When did that happen?" Such viewer reactions may signal a miscalculation or a technical mistake on the part of the film makers. If this plight befalls a

movie or television show, it may result in fewer viewers, however, if a high-stakes assessment item suffered a genuine flaw, the result could be potentially damaging to all concerned.

Unlike pencil-and-paper test items, little is known about visually complex video stimuli. The classroom we created contained 22 fifth-grade children and a teacher. In each of the sequences, the examinee watches an interaction: student-teacher interaction, teacher-led discussion, student participation activities, etc. Given this amount of visual information, to what will examinees pay attention? Although we intend to give examinees a challenging observation and discrimination task, it remains critical that we restrict possible interpretations of the scene so that there is a single, defensible answer to the test question. This is particularly true if a multiple-choice item format is employed.

For the test developer to narrow the number defensible answers requires knowledge of pedagogy combined with an understanding of filmic conventions and technology. Control over the viewer's attention is achieved by manipulating the elements of visual storytelling. These elements include acting, editing, screen position, image size, use of diegetic and non-diegetic information, sound location, and lighting. Until a large-scale field test with novice teachers is complete, we cannot report how successful we have been in controlling possible interpretations. A recent small-scale try-out was promising, however.

Some Preliminary Evidence

Recently, we had the opportunity to present the video items in both constructed- and selected- response formats to a group of experienced teachers. We hoped that experienced pedagogues would do very well, observing the important aspects of each scene and making the correct inferences. Clearly, if experienced teachers failed to reach the intended conclusions, our effort would be inappropriate for novice teachers. Fortunately, the results of these try-outs were positive. The experienced teachers performed very well. The few wrong answers that teachers did provide are illuminating. The incorrect responses also serve to highlight the complexities of working with videotape stimuli.

The video-stimulus items are secure, and therefore, we cannot discuss item content or examinee performance in detail here. A few general comments will indicate our findings, however.

The test items associated with each scene were developed in two formats. In constructed-response items, examinees watch a classroom sequence and are then asked to provide short-answer observations about some particular aspect of the scene they have viewed. In the multiple-choice version, examinees are asked a specific question about the scene they have viewed and must select one of four answer options. The questions for each scene are roughly parallel in content; the constructed- and selected-response items require making the same observations from the videotape.

In general, examinee performance was not affected by item format. Performance was affected, however, by the video stimulus. In particular, the item associated with one scene was difficult for examinees. A few examinees answered this item correctly, but most did not.

Teacher-examinees who were administered the constructed-response test form gave answers to this item which suggest that there is insufficient evidence on screen to support the intended answer. Most of the wrong answers made mention of the relevant portion of the scene, but analyzed it inaccurately. Thus, it may be that the evidence is sufficiently clear, but is not on screen long enough for examinees to consider it carefully.

Teacher-examinees who received the multiple-choice version were asked to write short explanations of their answer selections. Their descriptions make clear that they had the same sorts of difficulty as the teachers who answered the constructed-response questions.

We are now in the process of gathering data that will allow us to improve this particular item. In the discovery process, however, we are learning much that will allow us to create more relevant and realistic video-stimulus items.

## Conclusions

To conclude, let us consider what the content of this paper has to do with its title, "Elementary Education Licensing Examinations for the '90s." We have focused on a particular

teacher assessment program that is being developed in the late '80s. If our nation's teacher candidates are fortunate, however, the program being developed in Connecticut will become a model for elementary teacher assessment in the '90s. It is a multifaceted model that samples prospective teachers' abilities over a three-year period, the form of assessment increasing in complexity and job relevance as the trainees develop and grow. It is a system that ensures essential literacy, and while it demands both subject-matter and pedagogical knowledge, it explicitly recognizes the complex relationship between these domains. The Connecticut Teacher Examination Program recognizes that teachers are individuals who teach, and therefore it focuses considerable attention on candidates once they have reached the classroom. It fosters teachers as well as evaluates them.

The second phase of this evaluative process has been the focus of this paper. The Connecticut Elementary Education Certification Examination underscores the importance of subject-matter knowledge, but recognizes that in the classroom, subject matter is fused with pedagogy. We attempt to assess three regions of knowledge in this exam and to test each in the form to which it is best suited. Matters of knowledge are assessed by traditional means that have proven effective for that task. Where feasible, the integration of subject-matter and pedagogical knowledge is evaluated with classroom-relevant materials that allow examinees to make decisions that closely reflect the demands of teaching. Finally, we have attempted to recognize the

interactive complexities of the classroom by using videotaped simulations from which examinees can make observations and decisions that more closely approximate the demands of teaching.

Much work is yet to be done. Particularly with respect to materials-based items and videotaped items, our efforts are more exploratory than definitive. Even so, we can see that there is considerable promise in our work, and we look forward to continuing it in the 1990s.

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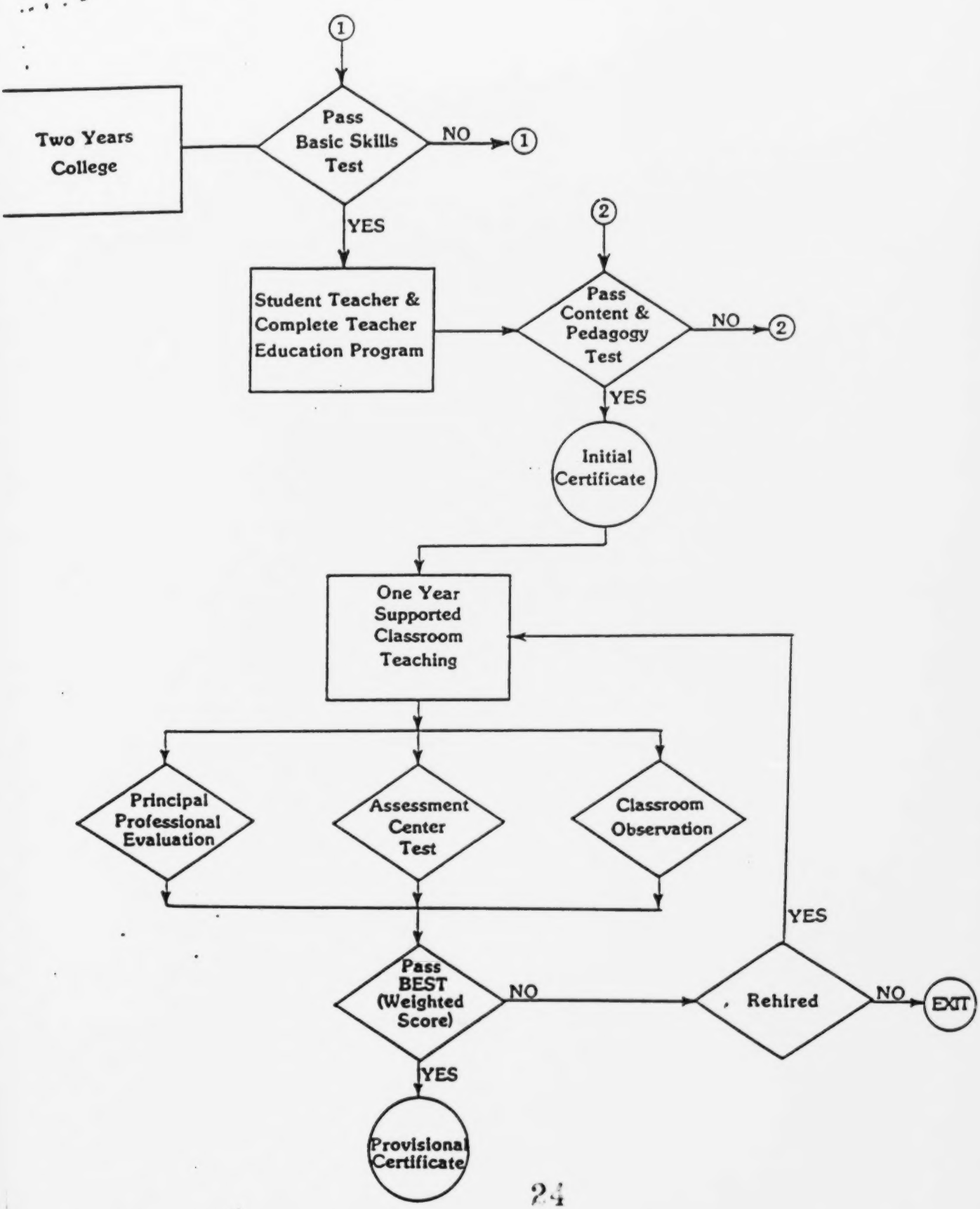




**Figure 1: Connecticut Three-tiered Beginning Teacher Assessment Program**